

Safety Basic Monitor

User Manual



...supports the requirements for AS-i Safety up to SIL3

Subject to modifications without notice.

Generally, this manual refers to products without mentioning existing patents, utility models, or trademarks.

The absence of any such references does not indicate that a product is patent-free.

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More than safety.



EUCHNER

EUCHNER GmbH + Co. KG
Kohlhammerstraße 16
70771 Leinfelden-Echterdingen
Germany

EG-Konformitätserklärung
EC-Declaration of Conformity
CE-Déclaration de Conformité
CE-Dichiarazione di conformità
CE-Declaración de Conformidad

Original DE
Translation EN
Traduction FR
Traduzione IT
Traducción ES

Die nachfolgend aufgeführten Produkte sind konform mit den Anforderungen der folgenden Richtlinien (falls zutreffend):
The beneath listed products are in conformity with the requirements of the following directives (if applicable):
Les produits mentionnés ci-dessous sont conformes aux exigences imposées par les directives suivantes (si valable)
I prodotti sotto elencati sono conformi alle direttive sotto riportate (dove applicabili):
Los productos listados a continuación son conforme a los requisitos de las siguientes directivas (si fueran aplicables):

I:	2006/42/EG 2006/42/EC 2006/42/CE 2006/42/CE 2006/42/CE	Maschinenrichtlinie Machinery directive Directive Machines Direttiva Macchine Directiva de máquinas
II:	2004/108/EG 2004/108/EC 2004/108/CE 2004/108/CE 2004/108/CE	EMV Richtlinie EMC Directive Directive de Compatibilité électromagnétique Direttiva EMV Directiva CEM

Die Schutzziele der Niederspannungsrichtlinie wurden gemäß Anhang I, Nr. 1.5.1 der Maschinenrichtlinie eingehalten.
The safety objectives of the Low-Voltage Directive comply with Annex I, No. 1.5.1 of the Machinery Directive.
Les objectifs de sécurité de la Directive Basse Tension sont conformes à l'annexe I, No. 1.5.1 de la Directive Machines.
Gli obiettivi di sicurezza della Direttiva Basse Tensione sono conformi a quanto riportato all'allegato I, No. 1.5.1 della Direttiva Macchine.
Los objetivos de seguridad de la Directiva de Bajo Voltaje cumplen con el Anexo I, No. 1.5.1 de la Directiva de Máquinas.

Folgende Normen sind angewandt:
Following standards are used:
Les normes suivantes sont appliquées:
Vengono applicate le seguenti norme:
Se utilizan los siguientes estándares:

a:	EN 50295:1999 (AS-i)
b:	EN 61508:2001
c:	EN 62061:2005
d:	EN ISO 13849-1:2008

Bezeichnung der Bauteile <i>Description of components</i> <i>Description des composants</i> <i>Descrizione dei componenti</i> <i>Descripción de componentes</i>	Type <i>Type</i> <i>Type</i> <i>Tipo</i> <i>Typo</i>	Richtlinie <i>Directives</i> <i>Directive</i> <i>Direttiva</i> <i>Directivas</i>	Normen <i>Standards</i> <i>Normes</i> <i>Norma</i> <i>Estándares</i>	Zertifikats-Nr. <i>No. of certificate</i> <i>Numéro du certificat</i> <i>Numero del certificato</i> <i>Número del certificado</i>
Safety Basic Monitor, successor for AS-i consortial Safety Monitor, compatible replacement	SBM-11-S08	I, II	a, b, c, d	44 205 11 401178 000
Safety Basic Monitor, enhanced	SBM-11-N08	I, II	a, b, c, d	44 205 11 401178 000

Benannte Stelle
Notified Body
Organisme notifié
Sede indicata
Entidad citada

NB 0044
TÜV NORD CERT GmbH
Langemarkstrasse 20
45141 Essen - Germany

Leinfelden, November 2011

EUCHNER GmbH + Co. KG
Kohlhammerstraße 16
70771 Leinfelden-Echterdingen
Germany

Dipl.-Ing. Michael Euchner
Geschäftsführer
Managing Director
Gérant d'affaires
Direttore Generale
Director Gerente

Duc Binh Nguyen
Dokumentationsbevollmächtigter
Documentation manager
Responsable documentation
Responsabilità della documentazione
Agente documenta

1. Symbol Catalog



Information!

This symbol indicates important information.



Attention!

This symbol warns of a potential failure. Non-compliance may lead to interruptions of the device, the connected peripheral systems, or plant, potentially leading to total malfunctioning.



Warning!

This symbol warns of an imminent danger. Non-compliance may lead to personal injuries that could be fatal or result in material damages and destruction.

1.1 Abbreviations

AS-i	AS-interface (actuator sensor interface)
I/O	Input/output
EMC	Electromagnetic compliance
PELV	Protective extra-low voltage
PFD	Probability of failure on demand
SaW	Safety at Work, safety technic
OSSD	Output Signal Switching Device, release circuit

2. General Remarks

Please read this chapter carefully before working with the documentation and the Safety Monitor.

2.1 Product information

This user manual is valid for the following Euchner GmbH devices:

2.1.1 Safety Basic Monitor

Safety Basic Monitor without Power Supply Decoupling Unit	SBM-11-S08
Safety Basic Monitor with Power Supply Decoupling Unit	SBM-11-N08

2.2 Function of this manual

This manual instructs for the safe assembly, electrical installation, addressing, start-up as well as for the operation and for the maintenance of the Safety Monitor.

This manual does **not** provide instructions for operating machines, on which this module is built in. Please view the appropriate machine manual for corresponding information.



Information!

Additional information concerning the technical data as well as the parameterization of the Safety Monitor can be found at <http://www.euchner.de>.

2.3 Target group

This manual is intended for designers, developers and operators of systems that will be safeguarded by one or more Safety Monitors. The manual is also targeted to people integrating Safety Monitors into machinery, performing the initial start-up, or maintaining them.

2.4 AS-i specification 3.0

The AS-i 3.0 devices already fulfil the AS-i specification 3.0.

The previous specifications (2.1 and 2.0) are supported as well.

3. Safety

This chapter contains user safety information.



Warning!

Please read this chapter carefully before using the Safety Basic Monitor in combination with other machine safeguarding components on protected machinery.

3.1 Experienced staff

The Safety Basic Monitor must only be installed, operated, and maintained by qualified staff.

Qualified is a person who

- has a suitable technical education
- has been instructed in operating the machinery and has been informed about the valid safety guidelines by the machinery operator
- has access to the user manual.

3.2 Application area of the device

The Safety Monitor combines a SaW I/O module and a Safety Monitor in one IP20 enclosure.

Special characteristics:

- **Safety Monitor in IP20**
- **up to 8 / 4 local safe inputs**
optionally the safe inputs will be used as well as standard inputs and signal outputs
- **2 (4) local electronical safe outputs**
- **safe AS-i outputs are supported**
max. 8 independent AS-i outputs
multiple safe AS-i outputs possible via a single address
- **chip card for storage of configuration data**

The module is certified according to EN 62 061, SIL 3, and EN 13 849, performance level "e".

3.3 Correct use

The Safety Basic Monitor must only be used as defined in chap. <Application area of the device>. The Safety Basic Monitor must only be used on the system, at which it was installed in accordance with this manual by adept personnel.



Information!

If used in a way differing from this description or if the device has been changed in any way – even during installation – any warranty claims with respect to Euchner GmbH are invalid.

3.4 AS-i Safety at Work

AS-i Safety at Work combines safe and non-safe data on a bus system. The classification AS-i Safety at Work identifies the safe data transfer that enables the integration of safety procedures in an AS-i network.

The components of AS-i Safety at Work conform to EN 50295 and are compatible with all other AS-i components. Therefore, existing AS-i applications can easily be extended with safety-relevant functions.

AS-i Safety at Work always requires a Safety Monitor (as a stand-alone device or integrated into a Gateway), that evaluates the safe signals on the bus, and a safe AS-Interface bus connection, that enables the transfer of safe signals from safety-relevant components (AS-i SaW input).

Additionally, decentralized safe AS-i SaW outputs can be added. Controlled by the Safety Monitor these outputs can be used to safely switch off safe actuators.

Several Safety Monitors and safe input and output slaves can be used on an AS-i system. At the same time, the Safety Monitors can be parameterized and, thus, be checked through AS-i and the configuration software.



Information!

By utilizing AS-i Safety at Work safety requirements up to category 4 according to EN 954-1 and additionally performance level "e" according to EN 13 849 as well as SIL 3 according to EN 62 061 can be satisfied.

In order to satisfy the requirements of these safety categories, all peripheral components, for instance the Safety Monitors, all safe bus connections, and all connected sensors must satisfy these standards.

3.5 Disposal



Information!

Electronic waste is hazardous waste. Please comply with all local ordinances when disposing this product!

The device does not contain batteries that need to be removed before disposing it.

4. Product Description

This chapter is intended to inform the reader about the special characteristics of the Safety Monitor. It describes the design and the functionality of the devices.



Warning!

This chapter must be read before installation and operation of the device in conjunction with other safety components on protected machinery.

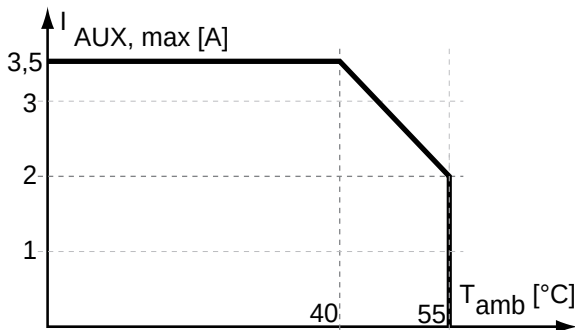
4.1 Technical data

The technical data are placed in the data sheet. Please view the current version on the web page: www.euchner.de

4.2 Special characteristics of the Safety Basic Monitor

- The module uses only the necessary AS-i addresses.
- Various configuration possibilities for the safe inputs (see chap. <Configuration possibilities for the safe inputs>).
- No limitation of cable length at safe inputs (the maximum loop resistance is 150 Ohm).
- A safe signal exchange of 2 signals between Safety Monitor and AS-i Safety Module as well as between two AS-i Safety Modules are possible.
- LED displays acc. to other Safety Slaves or to the Monitor.
- Simple configuration of the AS-i-Slaves using ASIMON.
- Chipcard for the simple exchange.
- Micro-USB port for configuring with AS-i-Control-Tools and ASIMON.

4.2.1 Derating by 24 V auxiliary power



4.3 Safety relevant data

Characteristics	Value	Standard
Safety category	4	EN 954-1
		EN 13 849-1:2008
Performance Level (PL)	e	EN 13 849-1:2008
Safety Integrity Level (SIL)	3	IEC 61 508, EN 62 061
Service life (TM) [year]	20	EN 13 849-1:2008
Maximal power-on time (month)	12	IEC 61 508
PFD	$9,58 \times 10^{-7}$	EN 62 061
PFH _D ¹	$5,08 \times 10^{-9}$	IEC 61 508, EN 62 061
Max. reaction time [ms]		IEC 61 508
AS-i input slave → local output	40	
local input → local output	20	
local input → AS-i code sequence	26	
AS-i input slave → AS-i code sequence	45	

Tab. 4-1.

1. Probability of a dangerous loss per hour.

To determine the safety characteristics (PFD and PFH), the values of all components using this function are to be considered. The module provides no significant contribution to the PFD or PFH values of the complete system. For the values of other components, please refer to relevant documentation.



Attention!

If the option „augmented reliability“ is selected the response time can extend.



Attention!

Error states of the remote outputs used in the safe configuration can be eliminated by starting and stopping the monitor.

4.4 Requirements for the voltage supply +24 V_{EXT} (AUX)



Information!

The externally connectable circuits are to be separated from the net absolutely reliable!

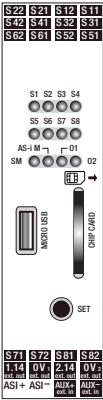
The power supply +24 V_{EXT} may only occur via SELV or PELV networks.



Attention!

The power supply for the 24 V supply must also have isolation per IEC 60 742 and be able to handle momentary power interruptions of up to 20 ms. The maximum output voltage of the power supply must also be less than 42 V in case of a fault.

4.5 Front view and connections



Micro USB

Micro USB interface

SET

service button // bouton service // compasse service // botón servicio

Chip Card

chip card

connection	2-channel	direction
S11	2-channel safety input 1	output
S12		input
S21		output
S22		input
S31	2-channel safety input 2	output
S32		input
S41		output
S42		input
S51	2-channel safety input 3	output
S52		input
S61		output
S62		input
S71	2-channel safety input 4	output
S72		input
S81		output
S82		input

1.14_{ext.out}

Safe semiconductor output 1

2.14_{ext.out}

Safe semiconductor output 2

0V_{ext.out}

ground connection for semiconductor output

ASI+, ASI-

AS-i connection

AUX+, AUX-

connection to ext. 24 V_{DC}

4.6 Inputs

The inputs are powered by the 24 V auxiliary power supply. Each input consists of two terminals: a passive input pin and an active test pulse output. A switch connects the two pins together.

Two of the safe inputs are also usable as inputs for OSSDs, and the others for potential-free contacts only.

Each safe input can also be configured as two standard inputs. The test pulse outputs can also be switched as diagnostics outputs (non safety).

For additional information see chap. <Additional connection examples>.

4.7 Outputs

The outputs must be powered by a PELV power supply.

The maximum output current is 700 mA per output, and the outputs are suitable for DC13 loads.

The plus side of the output load is at **1.14** or **2.14**. The minus side of the output load must be connected to the 0Vext out.

The lines between the module and the load must be routed so that no extraneous voltages caused by damaged insulation can inadvertently switch the load.

4.7.1 Push button

The Teach/Service button (SET) has the following functions:

- Error acknowledgement
- PC-less substitution of Safety Slaves

Keystroke	Description
< 1s	Error acknowledgement
> 1s	Changing to projecting mode The master goes into projecting mode and the safety unit is ready to learn a code sequence (analogous to learning using the Set key on standard monitors).
< 1s	Projecting mode is exited <u>without</u> changes.
> 1s	Saving the actual configuration in the master Teaching the individual code sequence of a newly safety-configured slave when exactly one safety-configured slave is replaced.

For additional information see Tab. <LEDs>.

4.8 LEDs

LEDs	Status	Signal // Description
S1, S2, S3, S4, S5, S6, S7, S8 (yellow)		contact (S1 ... S8) open
	 1 Hz	cross circuit //
		contact (S1 ... S8) closed
SM ¹ (green) (red) (yellow)		AS-i supply power not OK
	 1 Hz	'protective mode' and ASIMON active
		
	 1 Hz	'configuration mode' and ASIMON active //
		'configuration mode' active
	 2 Hz	at least 1 device in state 'red flashing' or 'yellow flashing'
	 2 Hz	
	 1 Hz	service button, state: 'teach-error'
		service button, state: 'ready'
AS-i M ² (red) (green)		off-line, monitor mode
	 1 Hz	'peripheral fault' without 'config error'
		'config error', auto addressing <i>not</i> possible
	 1 Hz	'config error', auto addressing possible
	 2 Hz	
		master: 'protective mode', no error //
	 1 Hz	master: 'configuration mode', no error //
O1, O2 ³ (yellow) (red)		output (O1, O2) off
	 1 Hz	restart inhibit
	 8 Hz	correctable error codition
		output (O1, O2) on
		no auxiliary voltage
SM, AS-i M, O1, O2	 1 Hz	competing master active

Tab. 4-2. LEDs

- 'yellow' has higher priority than 'red' and 'green' and will displayed preferentially.

- 2. If 'config-error' and 'peripheral fault' occur simultaneously, only 'config-error' is displayed.
- 3. 'red' has higher priority than 'yellow'

4.8.1 LED flashing sample

operation	LEDs	frequency	Status			
chip card will be written (yellow)	S1-S4	2 x 1 Hz				
	S5-S8					
	SM, AS-i M, O1, O2	 table 4-2				
internal error (red)	S1-S4	—				
	S5-S8	—				
	SM, AS-i M, O1, O2	8 Hz				
data on the chip card + device diffe- rent (yellow)	S1-S4	1 Hz				
	S5-S8					
	SM, AS-i M, O1, O2	 table 4-2				
chip card defect (yellow)	S1-S4	1 Hz				
	S5-S8					
	SM, AS-i M, O1, O2	 table 4-2				

Tab. 4-3.

legend

		flashing in common mode
		flashing in push-pull mode
		off
		on
		standard view acc. to table 4-2

Tab. 4-4.

4.9 Chip card

The chip card stores the addresses of the slaves. All programming operations are stored both in the module and on the chip card.

- The device can operate both with and without a chip card.
- If a blank chip card is plugged into a programmed module, the configuration of the module is stored on the chip card.
- If a non-blank chip card is plugged into a non-programmed module, the configuration of the chip card is transmitted to the module. The changes do not become effective until the module is restarted.
- If a non-blank chip card is plugged into a different programmed module, the configurations do not agree and an error message is displayed.

4.10 AS-i Power 24



only

SBM-11-N08 !

- internal decoupling network / AS-i voltage is generated out of 24 V_{ext} directly
- no external AS-i power supply, no external decoupling unit required!
- maximum 0,5 A for AS-i available using internal decoupling network
- switching between internal and external decoupling.

4.11 Decoupling function



only

SBM-11-N08 !

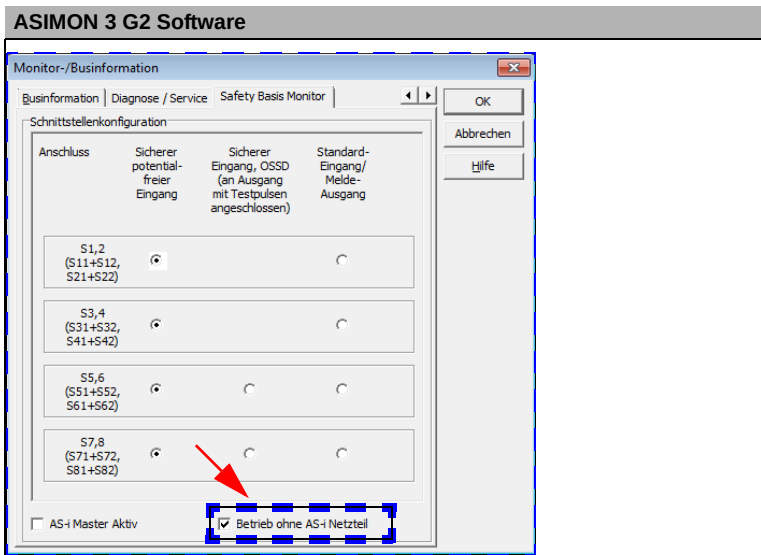
Bei activating the option "Operation without AS-i power supply" you can use the AS-i Power24V data decoupling network instead of an external AS-i power supply.



Information!

The internal decoupling unit can supply a maximum current of 500 mA.

Simply open the 'Monitor-/Bus Information' window in ASIMON, select the tab 'Safety Basis Monitor' and activate the check box "Operation without AS-i power supply".



Information!

Please note additional information in the manual for the ASIMON software.

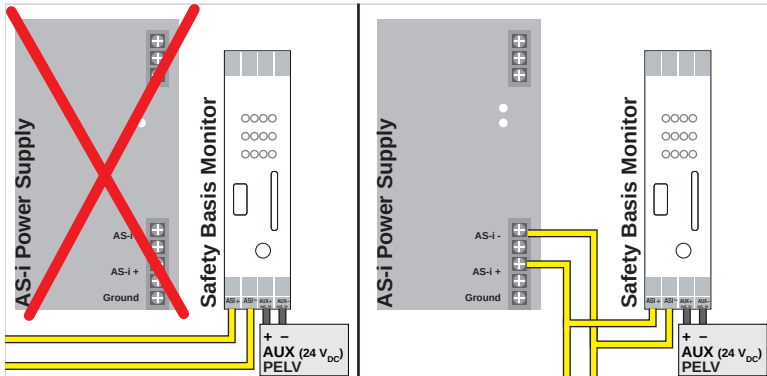
4.12 AS-i supply options

SBM-11-N08

SBM-11-S08 +
SBM-11-N08

internal decoupling

external decoupling



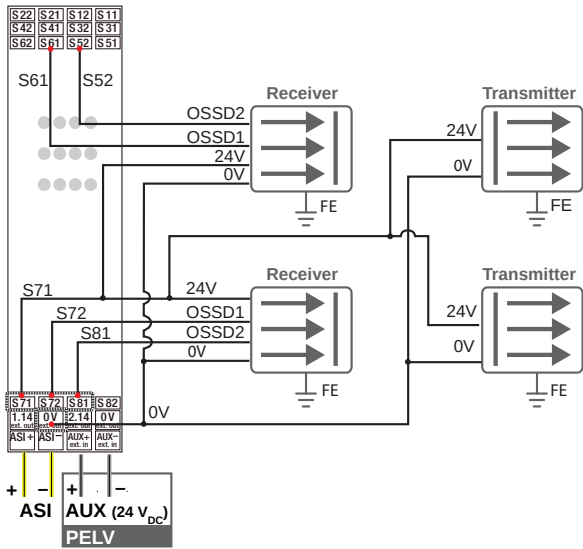
Tab. 4-5.



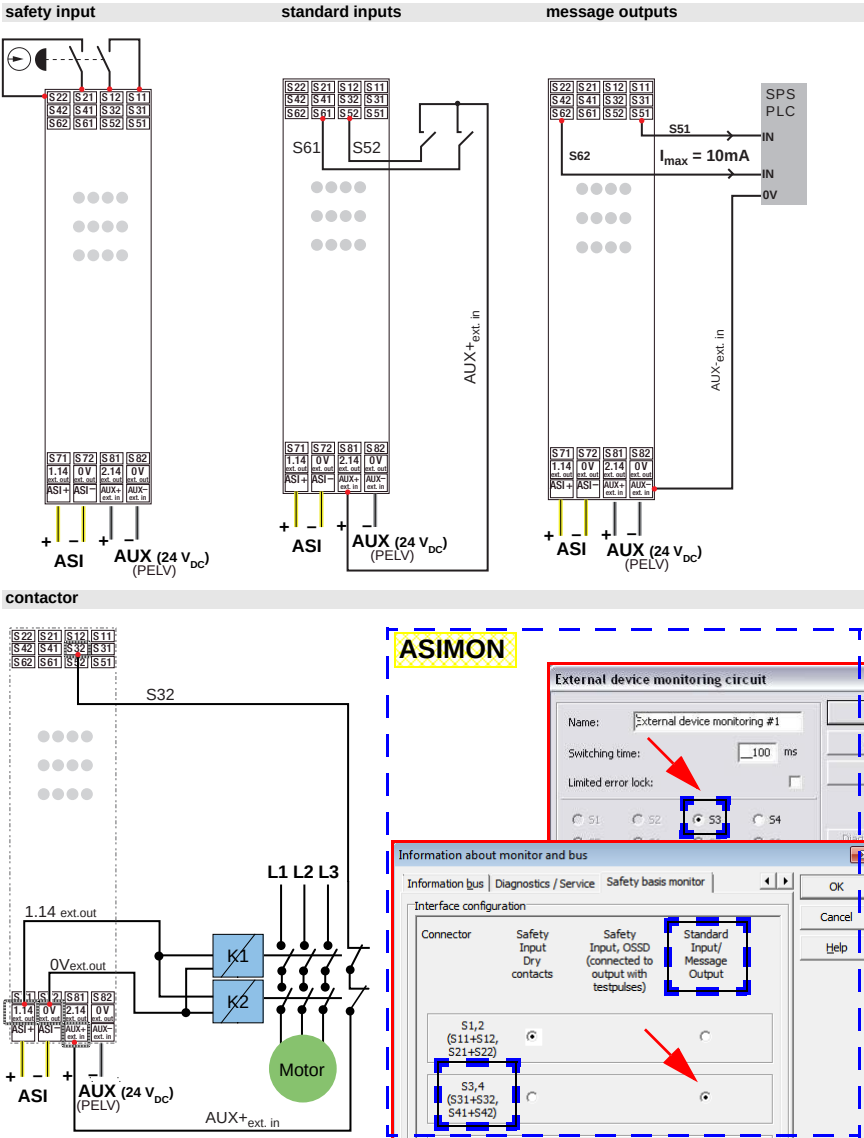
Attention!

The AS-I power supply for the AS-I components must have isolation per IEC 60 742 and be able to handle momentary power interruptions of up to 20 ms. The power supply for the 24 V supply must also have isolation per IEC 60 742 and be able to handle momentary power interruptions of up to 20 ms. The maximum output voltage of the power supply must also be less than 42 V in case of a fault.

4.13 Connecting of an OSSD, supplying of several OSSDs out of the same connection (S71)



4.13.1 Additional connection examples



Tab. 4-6. Additional connection examples

5. Maintenance

5.1 Controlling safe shutdowns

The plant safety engineer is responsible for verifying that the Safety Basic Monitor works correctly as part of the safety system.

At least once a year it is necessary to verify the safe shutdown by initiating associated safety-related sensors or switches:



Attention!

Press each safety-related AS-i slave and watch the reaction of the output circuits of the AS-i Safety Monitor.



Attention!

Check the maximum activated time and the total operating time. These values depend on the PFD value chosen for the total failure probability. Please refer to the information in chap. Safety relevant data.

After reaching the projected maximum operating time (three, six, or twelve months) the entire safety system must be checked for proper operation.

After reaching the projected total usage time (20 years) the device must be checked by the manufacturer concerning its proper operation.

6. AS-i Diagnostics

6.1 Introduction

The device provides two different diagnostics modes:

- Consortial monitor, for replacement (see chap. 6.2)
- Compatibility mode with additional diagnostics data (see chap. 6.3)
- AS-i 3.0 (**S-7.5.5**), recommended (see chap. 6.4)

The respective diagnostics mode is selected using the ASIMON software.

- ☐ Simply open the 'Monitor/-Bus Information' window in ASIMON
- ☐ Select the 'Diagnostics/Service' tab
- ☐ There select the required diagnostics mode.

6.1.1 Data of the different diagnostics modes

	AS-i 3.0 (S-7.5.5), recommended (see chap. 6.4)	Consortial monitor, for replacement (see chap. 6.2)	Compatibility mode with additional diagnostics data (see chap. 6.3)
base address	S-7.5 communication (see chap. 6.4.1 ... 6.4.3)	consortial diagnostics (chap. 7.3.2 ... 7.3.6 software manual)	consortial diagnostics (chap. 7.3.2 ... 7.3.6 software manual)
simulate slave 1 base address+1	state OSSD1+OSSD2	state OSSD1+OSSD2	state OSSD1+OSSD2
simulate slave 2 base address+2	S-7.F slave, input data = 0	S-7.F slave, input data = 0	S-7.3.0.C slave (see chap. 6.3)
simulate slave 3 base address+3	S-7.F slave, input data = 0	S-7.F slave, input data = 0	S-7.3.1.C slave (see chap. 6.3)

Tab. 6-7.

6.2 Diagnostics mode "Consortial monitor, for replacement"



Information!

Diagnostics type: compatibility mode for Safety Basic Monitors starting with the Safety-Version 'SV4.3'.

Consortial diagnostics, with S-7-3 diagnostics added.

Address	Meanining
basic address	Consortial diagnostics, limited to 48 devices
simulated slave 1	status OSSD 1 and OSSD 2
simulated slave 2	S-7.F slave, input data = 0
simulated slave 3	

Tab. 6-8.

Simulated slave 1: status OSSD 1 and OSSD 2 (binary data)

Data bit	content
D0	status relay output 1
D1	status message output 1
D2	status relay output 2
D3	status message output 2

Tab. 6-9.

6.3 **Diagnostics mode "Compatibility mode with additional diagnostics data"**



Information!

Diagnostics type: compatibility mode for Safety Basic Monitors starting with the Safety-Version 'SV4.3'.

Address	Meanining
basic address	Consortial diagnostics, limited to 48 devices
simulated slave 1	status OSSD 1 and OSSD 2
simulated slave 2	S-7.3 OSSD diagnostics, 4 channel transparent input, Profil S-7.3.0.C
simulated slave 3	S-7.3 SaW slave diagnostics, 4 channel transparent input, profile 7.3.1.C

Tab. 6-10.

Simulated slave 1: status OSSD 1 and OSSD 2 (binary data)

Data bit	content
D0	status relay output 1
D1	status message output 1
D2	status relay output 2
D3	status message output 2

Tab. 6-11.

Simulated slave 2 (7.3.0.C): OSSD diagnostics

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CH1	Safety status OSSD 2								Safety status OSSD 1							
CH2	Safety status OSSD 4								Safety status OSSD 3							
CH3	Safety status OSSD 6								Safety status OSSD 5							
CH4	S8	S7	S6	S5	S4	S3	S2	S1	Safety status OSSD 7							

Tab. 6-12.

When switch **S1 ... S8** is closed a '1' is entered in the corresponding position.
The Safety Status is defined as follows:

Bit	7	6	5	4	3	2	1	0
	1: not less than one device red flashing	1: not less than one device yellow flashing	n/a	n/a	OSSD color (siehe Tab. Status codes for the release circuits (OSSD))			

Tab. 6-13.

Simulated slave 3 (S-7.3.1.C)::SaW slave diagnostics

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CH1	Slv 7		Slv 6		Slv 5		Slv 4		Slv 3		Slv 2		Slv 1			
CH2	Slv 15		Slv 14		Slv 13		Slv 12		Slv 11		Slv 10		Slv 9		Slv 8	
CH3	Slv 23		Slv 22		Slv 21		Slv 20		Slv 19		Slv 18		Slv 17		Slv 16	
CH4	Slv 31		Slv 30		Slv 29		Slv 28		Slv 27		Slv 26		Slv 25		Slv 24	

Tab. 6-14.

For each safe slave (ID=B) the status of the code sequence is entered as seen by the Master. Code sequence errors are not detected here. For non-safe slaves '00' is entered.

Bit-combination	meaning
00	Not a safe slave or save slave with zero sequence, both switches open
01	Safe slave, switch for upper bits open
10	Safe slave, switch for lower bits open
11	Safe slave, both switches closed

Tab. 6-15.

6.3.1 Status codes for the release circuits (OSSD)

Code bit [3..0]	Status / color	Description
0	green permanent lighting	Output on
1	green flashing	delay time is running at stop category 1
2	continuous yellow	start-up/restart-disable active
3	yellow flashing	External test required / acknowledgement / Turn-on delay active
4	red permanent lighting	Output off
5	red flashing	Error
6	grey or off	output not projected
7 ... F	reserved	

Tab. 6-16.



Information!
Monitors which support less than 8 release circuits do not set all release circuits present to "grey".

6.4 **Diagnostics mode "AS-i 3.0 (S-7.5.5), recommended"**

6.4.1 **Binary data**

	D3	D2	D1	D0
input data	Serial communication	Serial communication	1: Output 2 either turned off or flashing green	1: Output 1 either turned off or flashing green
output data	–	–	Serial communication	Serial communication

Tab. 6-17.

6.4.2 **Transparent input data**

Using profile 7.5.5 it is possible to poll the status of the release circuits (OSSD Safety Control Status) of the Safety Monitor cyclically (see table below). To do this you must assign an AS-i address (basic address) to the Safety Monitor and assign an 8-byte analog input slave to the basic address of the Safety Monitor. These 8 bytes contain the diagnostics data (transparent input data) as shown in the following table:

channel	2 ¹⁵	2 ¹⁴	2 ¹³	2 ¹²	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
CH0	AS-i circuit 2								AS-i circuit 1							
	AU	MO			S8	S7	S6	S5	S4	S3	S2	S1	UA1	UA		
CH1	Safety status OSSD 4				Safety status OSSD 3				Safety status OSSD 2				Safety status OSSD 1			
CH2	Safety status OSSD 8				Safety status OSSD 7				Safety status OSSD 6				Safety status OSSD 5			
CH3	OSSD 8		OSSD 7		OSSD 6		OSSD 5		OSSD 4		OSSD 3		OSSD 2		OSSD 1	
	RF	YF	RF	YF	RF	YF	RF	YF	RF	YF	RF	YF	RF	YF	RF	YF

Tab. 6-18.

Channel '0' of the transparent input data describes the status of the two AS-i segments. The upper 8 bits describe the status of AS-i segment 2, the lower 8 the status of AS-i segment 1.

In Channels 1 and 2 the colors of the release circuits then follow (only two are used at present).

Channel 3 then indicates combined information for the colors of the devices in the release circuits.

Then the information is listed individually:

MO	Operating mode	1: Safety Monitor in protected operating mode 0: Safety Monitor in configuration operation
UA	UAS-i	AS-i voltage greater than 18 V 1: voltage is sufficient 0: voltage is <i>not</i> sufficient

AU	AUX 24V	The 24 V for supplying the safe outputs is present 1: 24 V for supplying the safe outputs is present 0: 24 V for supplying the safe outputs is <i>not</i> present
UA1	Warning	AS-i voltage OK, but less than 22.5 V 1: AS-i voltage greater than 22.5 V 0: AS-i voltage less than 22,5 V
S1-S8	Switch	S1-S8: for a closed switch S1 ... S8 '1' is entered at the corresponding position.

Channels 1 and 2 describe the states of the respective release circuits (OSSD's) of the Safety Monitor. For status codes and colors see section Status codes for the release circuits (OSSD).

Channel 3 contains information as to whether there are warnings or faults in a release circuit for one or more devices assigned to this release circuit. The meanings are as follows:

YF	Yellow flashing	At least one of the devices associated with this release circuit is in the yellow flashing state
RF	Red flashing	At least one of the devices associated with this release circuit is in the red flashing state

Tab. 6-19.

6.4.2.1 Status codes for the release circuits (OSSD)

Code bit [3..0]	status / color	Description
0	green permanent lighting	output on
1	green flashing	delay time is running at stop category 1
2	yellow permanent lighting	start-up/restart-disable active
3	yellow flashing	external test necessary / acknowledgement / start delay active
4	red permanent lighting	output off
5	red flashing	error
6	grey or off	output not projected
7 ... F	reserved	

Tab. 6-20.

6.4.2.2 Transparent output data

The transparent output data are available there to the safe unit as non-safe additional bits, for example for Start buttons. They are linked with the input bits of the input configured as non-safe terminals.

Ch	2 ¹⁵	2 ¹⁴	2 ¹³	2 ¹²	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
0	reserved								S8	S7	S6	S5	S4	S3	S2	S1

Tab. 6-21.

6.4.3 Acyclical data

6.4.3.1 Vendor Specific Object 7 - device colors OSSD 1

Read only

This object contains the colors and additional information for all release circuits for all devices assigned to Release Circuit 1.



Information!

If not all 128 devices are assigned, the Monitor can shorten the S-7.5.5 telegram in order to save transmission time.

Coding for the states and colors

Byte	Meaning
1	bit 0 0=configuration mode, 1=protecting mode bit 3 ... 1 reserved, 0 bit 4 status S12 bit 5 status S21 bit 6 status S32 bit 7 status S41
2	relay status, output 1+2 bit 3 ... 0 status output 1 bit 7 ... 4 status output 2
3 ... 8	...
9	relay status output 15+16 bit 3 ... 0 status output 15 bit 7 ... 4 status output 16
10	bit field for devices which are present. Device 7 ... 0
11 ... 40	...
41	bit field for devices which are present. Device 248 ... 255
42	color device 1+2 bit 3 ... 0 color device 1 bit 7 ... 4 color device 2
43 ... 168	...
105	device 127+128 bit 3 ... 0 color device 127 bit 7 ... 4 color device 128

Tab. 6-22.

Bit field coding for devices which are present:

The numbers indicate the position of the bit for the corresponding device.

- 0: Device is not present
- 1: Device is present

Byte	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
...	...							
32	255	254	253	252	251	250	249	248

Tab. 6-23.

Coding of states and colors

Code	State or color
Bit [2 ... 0]	
0	green permanent lighting
1	green flashing
2	yellow permanent lighting
3	yellow flashing
4	red permanent lighting
5	red flashing
6	grey or off
7	non existent
Bit 3	0: Device is <i>not</i> present in this OSSD 1: Device is present in this OSSD

Tab. 6-24.

6.4.3.2 Vendor Specific Object 8 - device colors OSSD
with device index assignment

Read only.

This object contains, for all devices assigned to Release Circuit 1, the colors and additional information for all release circuits with the module index assignment from the configuration.

Coding of the states and colors

Byte	Meaning
1	bit 0 0=configuration operation, 1=protective operation bit 3 ... 1 reserved, 0 bit 4 status S12 bit 5 status S21 bit 6 status S32 bit 7 status S41
2	relay status output 1+2 bit 3 ... 0 status output 1 bit 7 ... 4 status output 2
3 ... 8	...
9	relay status output 15+16 bit 3 ... 0 status output 15 bit 7 ... 4 status output 16
10	bit field for devices which are present. Device 7 ... 0
11 ... 40	...
41	bit field for devices which are present. Device 248 ... 255
42	color device 1+2 bit 3 ... 0 color device 1 bit 7 ... 4 color device 2
43 ... 168	...
105	device 127+128 bit 3 ... 0 color device 127 bit 7 ... 4 color device 128

Tab. 6-25.

Bit field coding for devices which are present:

The numbers indicate the position of the bit for the corresponding device.

- 0: Device is *not* present
- 1: Device is present

Byte	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
...	...							
32	255	254	253	252	251	250	249	248

Tab. 6-26.

Coding of states and colors

Code Bit [2 ... 0]	State or color
0	green permanent lighting
1	green flashing
2	yellow permanent lighting
3	yellow flashing
4	red permanent lighting
5	red flashing
6	grey or off
7	non existent
Bit 3	0: Device is <i>not</i> present in this OSSD 1: Device is present in this OSSD

Tab. 6-27.

6.4.3.3 Vendor Specific Object 9 - device colors at switch off OSSD 1

Read only.

This object contains colors and additional information about all release circuits at the time of the most recent switch-off of release circuit 1. Additionally, information identifying all devices assigned to release circuit 1 is transferred.

Coding for the states and colors

Byte	Meaning
1	bit 0 0=Configuration mode, 1=protecting mode bit 3 ... 1 reserved, 0 bit 4 status S12 bit 5 status S21 bit 6 status S32 bit 7 status S41
2	relay status output 1+2 bit 3 ... 0 status output 1 bit 7 ... 4 status output 2
3 ... 8	...
9	relay status output 15+16 bit 3..0 status output 15 bit 7..4 status output 16
10	bit field for devices which are present. Device 7 ... 0
11 ... 40	...
41	bit field for devices which are present. Device 248 ... 255
42	bit field for devices which changed in the last step. Device 7 ... 0
43 ... 72	...
73	bit field for devices which changed in the last step. Device 248..255
74	color device 1+2 bit 3 ... 0 color device 1 bit 7 ... 4 color device 2
75 ... 200	...
137	device 127+128 bit 3..0 color device 127 bit 7..4 color device 128

Tab. 6-28.

Bit-field for devices that changed during the last step.

These numbers indicate the position of the bits that correspond to a certain device.

- 0: device not changed during the last step
- 1: device changed during the last step

Byte	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
...	...							
32	255	254	253	252	251	250	249	248

Tab. 6-29.

Bit field coding for devices which are present:

The numbers indicate the position of the bit for the corresponding device.

- 0: Device is not present
- 1: Device is present

Byte	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
...	...							
32	255	254	253	252	251	250	249	248

Tab. 6-30.

Coding of states and colors

Code	status bzw. color
Bit [2 ... 0]	
0	green permanent lighting
1	green flashing
2	yellow permanent lighting
3	yellow flashing
4	red permanent lighting
5	red flashing
6	grey or off
7	non existent
Bit 3	0: Device is <i>not</i> present in this OSSD 1: Device is present in this OSSD

Tab. 6-31.

6.4.3.4 Vendor Specific Object 10 - device colors at switch off OSSD 1 with device index-assignment

Read only.

This object contains colors and additional information about all release circuits at the time of the most recent switch-off of release circuit 1, sorted by the diagnostics index. Additionally, information identifying all devices assigned to release circuit 1 is transferred.

Coding of states and colors

Byte	Meaning
1	bit 0 0=configuration mode, 1=protective operation bit 3 ... 1 reserved, 0 bit 4 status S12 bit 5 status S21 bit 6 status S32 bit 7 status S41
2	relay status output 1+2 bit 3 ... 0 status output 1 bit 7 ... 4 status output 2
3 ... 8	...
9	relay status output 15+16 bit 3..0 status output 15 bit 7..4 status output 16
10	bit field for devices which are present. Device 7 ... 0
11 ... 40	...
41	bit field for devices which are present. Device 248 ... 255
42	bit field for devices which changed in the last step. Device 7 ... 0
43 ... 72	...
73	bit field for devices which changed in the last step. Device 248 ... 255
74	color device 1+2 bit 3 ... 0 color device 1 bit 7 ... 4 color device 2
75 ... 200	...
137	device 127+128 bit 3..0 color device 127 bit 7..4 color device 128

Tab. 6-32.

Bit field coding for devices which changed in the last step:

The numbers indicate the position of the bit for the corresponding device.

- 0: Device did not change in the last step
- 1: Device changed in the last step

Byte	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
...	...							
32	255	254	253	252	251	250	249	248

Tab. 6-33.

Bit field coding for devices which are present:

The numbers indicate the position of the bit for the corresponding device.

- 0: Device is not present
- 1: Device is present

Byte	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
...	...							
32	255	254	253	252	251	250	249	248

Tab. 6-34.

Coding of states and colors

Code Bit [2 ... 0]	State or color
0	green permanent lighting
1	green flashing
2	yellow permanent lighting
3	yellow flashing
4	red permanent lighting
5	red flashing
6	grey or off
7	non existent
Bit 3	0: Device is <i>not</i> present in this OSSD 1: Device is present in this OSSD

Tab. 6-35.

6.4.3.5 Vendor specific object 11 ... 38

Objects 11 ... 38 correspond to Objects 7 ... 10, but do not refer to the following release circuits. The table shows the relationship:

OSSD	device colors	device colors with device index	device colors at switch off	device colors at switch off mit device index
Vorverarb.	object 3	object 4	-	-
1	object 7	object 8	object 9	object 10
2	object 11	object 12	object 13	object 14
3	object 15	object 16	object 17	object 18
4	object 19	object 20	object 21	object 22
5	object 23	object 24	object 25	object 26
6	object 27	object 28	object 29	object 30
7	object 31	object 32	object 33	object 34
8	object 35	object 36	object 37	object 38
9	object 39	object 40	object 41	object 42
10	object 43	object 44	object 45	object 46
11	object 47	object 48	object 49	object 50
12	object 51	object 52	object 53	object 54
13	object 55	object 56	object 57	object 58
14	object 59	object 60	object 61	object 62
15	object 63	object 64	object 65	object 66
16	object 67	object 68	object 69	object 70

Tab. 6-36.

6.4.3.6 Vendor- specific object 110

Vendor specific object 110 describes the SaW slave diagnostics.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CH1	Slv 7		Slv 6		Slv 5		Slv 4		Slv 3		Slv 2		Slv 1			
CH2	Slv 15		Slv 14		Slv 13		Slv 12		Slv 11		Slv 10		Slv 9		Slv 8	
CH3	Slv 23		Slv 22		Slv 21		Slv 20		Slv 19		Slv 18		Slv 17		Slv 16	
CH4	Slv 31		Slv 30		Slv 29		Slv 28		Slv 27		Slv 26		Slv 25		Slv 24	

Tab. 6-37.

For each safe slave (ID=B) the status of the code sequence is entered as seen by the Master. Code sequence errors are not detected here. For non-safe slaves '00' is entered.

Bit-combination	meaning
00	Not a safe slave or save slave with zero sequence, both switches open
01	Safe slave, switch for upper bits open
10	Safe slave, switch for lower bits open
11	Safe slave, both switches closed

Tab. 6-38.



Information!

Please note additional information in the manual for the ASIMON software.

7. Configuration of the safe inputs

The unit is configured and diagnosed using the ASIMON software.

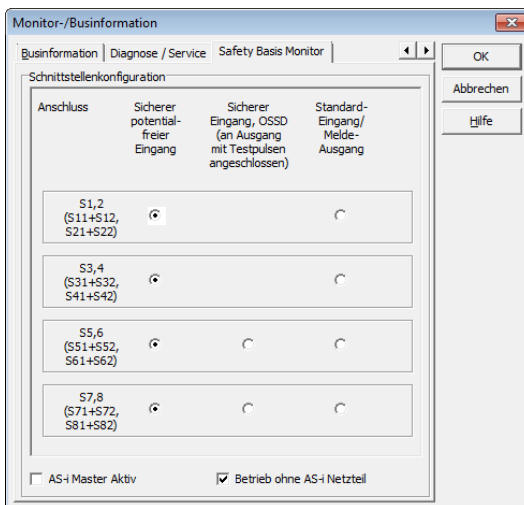
Communication takes place over the USB interface.

7.1 Configuration possibilities for the safe inputs

The safe inputs on the unit can be configured variously:

- Safe inputs for floating contacts.
Two inputs act together on one sub-device which can serve as the source for a safety device. Test pulses are used to check the inputs for cross-wire short.
- Safe inputs for self-testing OSSDs (only on contacts S5-S8).
Two inputs act together on one sub-device which can serve as the source for a safety device. The unit does not check the inputs for cross-wire short, since this is done by the OSSDs themselves.
- Standard inputs.
Each channel operates independently. The values can be used like the familiar monitor inputs.
- Diagnostics outputs.
The test pulse outputs of the input terminals (i.e. terminals S11, S22, S31, S42, S51, S62, S71, S82) can be used as diagnostics outputs (approx. 10mA max. output current). A safety device can be assigned to each input, where the status of the device is represented on the diagnostics output. The diagnostics output turns on when the device is "green".

Configuration is done in ASIMON, in the 'Monitor/Bus Information' window using the 'Safety Basis Monitor' tab.



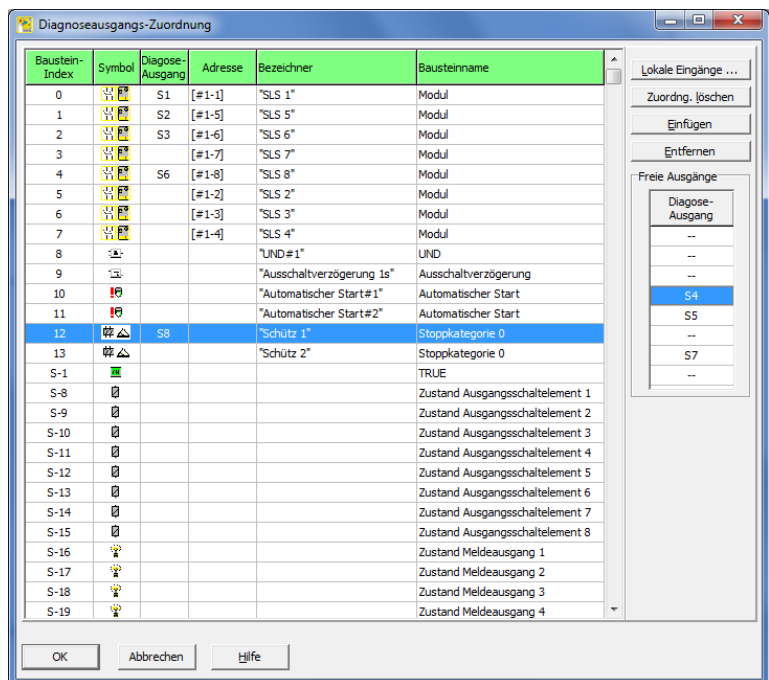
The ASIMON Control logic prevents invalid combinations.

	Safety Input Dry Contacts	Safety Input OSSD	Std Input	Diag Out
S1			√	√
S2			√	√
S3	√			
S4				
S5		√		
S6				
S7	√			
S8				

Tab. 7-39.

7.2 Assigning the diagnostics outputs

Diagnostics outputs represent the status of the selected safety devices. Outputs are assigned using the 'Diagnostics Output' column in the 'Module Index Assignment' field.



There the selected diagnostics outputs can be assigned to the module indices. Each diagnostics output can be assigned to just one safety device.

7.3 Safe configuration using ASIMON 3 G2



ASIMON 3 G2 Software

Change the preset password during the first use of the device (Monitor/change password)!



ASIMON 3 G2 Software

Create the desired configuration.



ASIMON 3 G2 Software

Download the configuration with MONITOR / PC-> MONITOR into the device. Enter the password for this purpose.



ASIMON 3 G2 Software

Acknowledge the request TEACH CODE SEQUENCES? selecting "Yes".



ASIMON 3 G2 Software

Check the configuration log (respect instructions in <chap. 5.8> of the ASIMON manual!).



ASIMON 3 G2 Software

Validate the configuration with MONITOR -> VALIDATION.



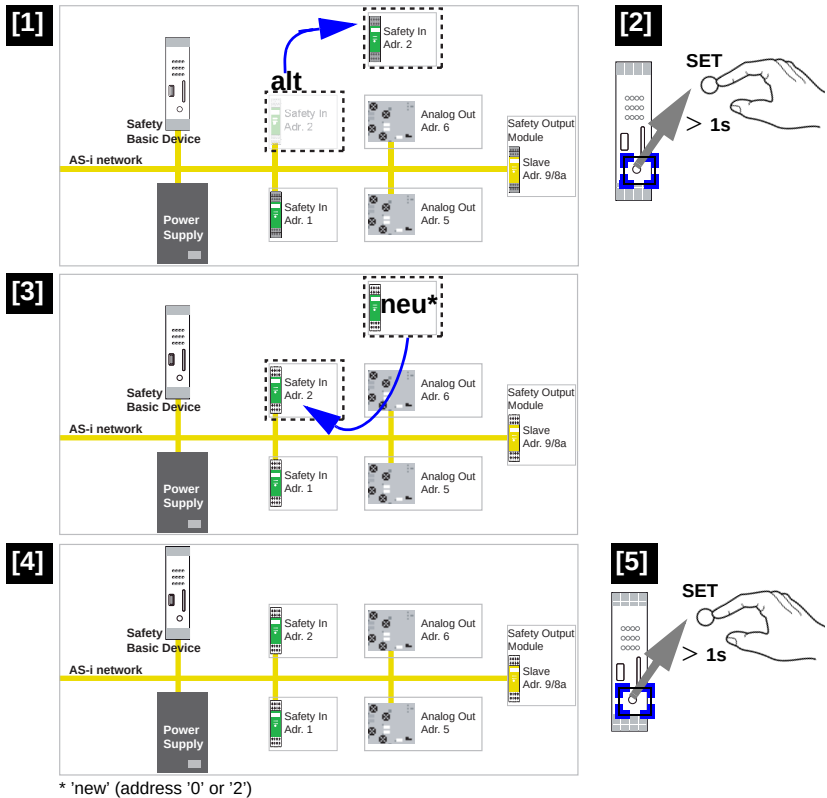
ASIMON 3 G2 Software

Start the monitor with MONITOR-> START.

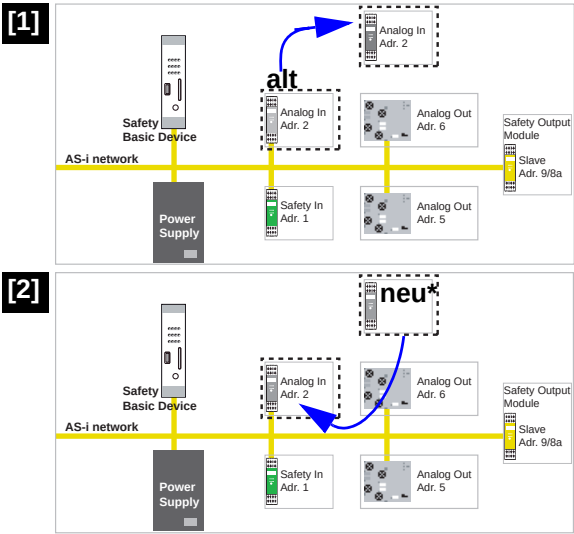


The correct safety function of the device must be verified once installed within the protected machinery!

7.3.1 Replacing a defective AS-i Safety Slave



7.3.2 Auto-addressing



* 'new' (address '0' or '2')

8. Safety Requirements

8.1 Safety consideration for selecting OSSD/potential-free contacts

Potential-free contacts are cross-circuit monitored by the module. OSSD outputs test themselves and only require that the module tolerate the test pulses.

If the module is incorrectly configured so that OSSDs are connected but potential-free contacts are configured, a cross-circuit is detected, since the test pulses which the module sends out on S82 and S62 do not correlate with the test pulses on S81 and S61. The error is thus detected.

If the module is incorrect configured so that potential-free contacts are connected by OSSDs are configured, Contact S81 / S82 is never seen as turned on, since S82 is not turned on as a supply pin for the OSSD module. The error is thus detected. The same applies by analogy to Contact S61 / S62.

8.2 Recommendation for improved availability of the function

The switching contacts should be turned off for at least 41 ms, since the safety monitor (depending on the set monitoring component) must recognize the INPUT OFF for a minimum number of AS-i telegrams. IF the minimum off time of 41 ms (depending on the number of slaves on the AS-i bus and the set monitoring component) is maintained, correct recognition of the input state is assured. Non-observation of this time may limit the availability of the AS-i Safety Monitor as follows:

- A setting of TWO-CHANNEL POSITIVE OPENING can cause the Safety Monitor to go into the error state; to eliminate the error state, the supply voltage for the Safety Monitor must be disconnected.
- A setting of TWO-CHANNEL DEPENDENT means the Safety Monitor allows release only after a sufficient off-time; the release can be achieved if the switching contacts are turned off for at least 41 ms .

9. Accessories

- **SBM-ZB-PGK (Ident-Nr. 113832)**
USB connector cable for Safety Basic Monitor
- **ZMO-ZB-MB10 (Ident-Nr. 100875)**
Chip card for GMOX/SMOX 32kByte
- **ESM-F-KK4 (Ident-Nr. 097195)**
Connecting kit ESM-F (Phoenix clamps 4 unit)